SMC Specifications and Standards Program

Mr. David E. Davis
SMC/EN
310 653-1427
david.davis@losangeles.af.mil

Report Documentation Page

Form Approved
OMB No. 0704-0188

1. REPORT DATE	2. REPORT TYPE	3. DATES COVERED
AUG 2011		**00-00-2011 to 00-00-2011**

4. TITLE AND SUBTITLE	5a. CONTRACT NUMBER
SMC Specifications and Standards Program	5b. GRANT NUMBER
	5c. PROGRAM ELEMENT NUMBER
6. AUTHOR(S)	5d. PROJECT NUMBER
	5e. TASK NUMBER
	5f. WORK UNIT NUMBER
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) **Air Force Space Command,Space and Missile Systems Center (SMC),SMC/EN,Los Angeles AFB,CA,90009**	8. PERFORMING ORGANIZATION REPORT NUMBER
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)	10. SPONSOR/MONITOR'S ACRONYM(S)
	11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release; distribution unlimited

13. SUPPLEMENTARY NOTES
Presented to: DMSMS and Standardization Conference, Hollywood, FL Aug 29-Sept 01, 2011

14. ABSTRACT

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			
unclassified	**unclassified**	**unclassified**	**Same as Report (SAR)**	**32**	

Is Development of Space Systems Different?

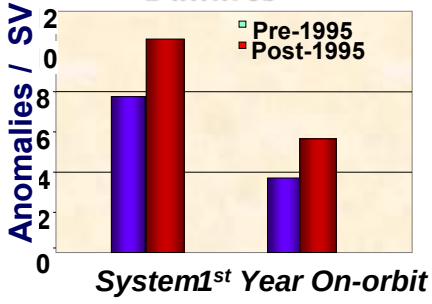
- **Launch is a "one-strike-and-you're-out" business**
- **Spacecraft must work by remote control for 15 years**
  - *Hostile environment*
  - *—Small" failures can cripple or end mission*

No "flight Testing" and No Service Calls in Space
Mandates Unique, High-Confidence Mission Assurance Culture

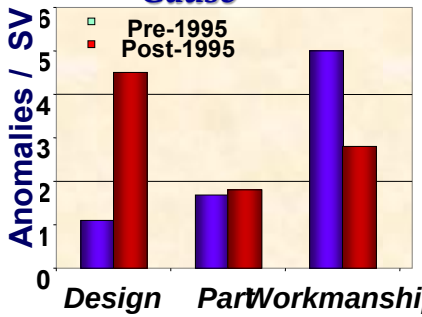
Space Business is Challenging

- On-Orbit
  - Infant Mortality dramatically increased
  - Secondary rise in failures due to …..
  - Orbital failure trends identifies increased number of early failures
- Factory Anomaly Failure Rates
  - Late build-cycle failures post-1995 have shown a dramatic increase
  - *System test failures are up 39%*
  - *57% increase in orbital failures*

Late Build-Cycle Failures



System Test Failure Cause



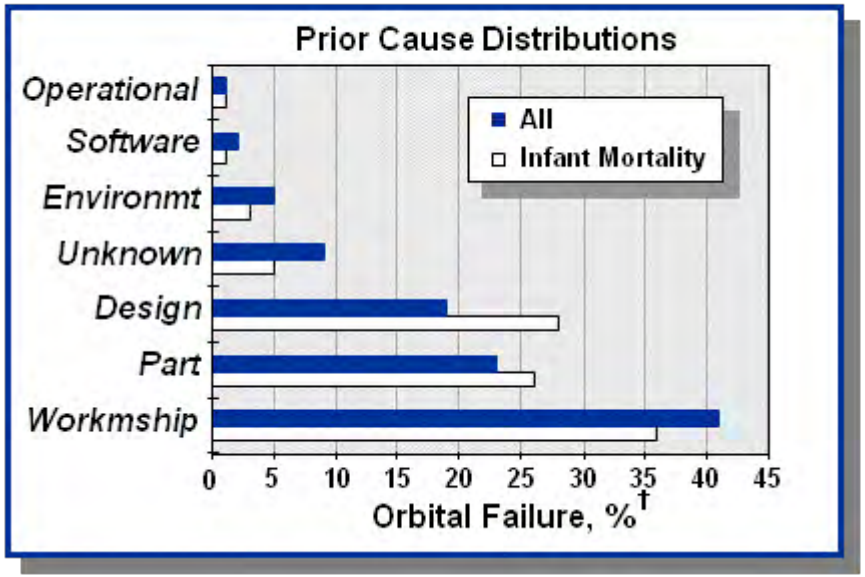
Root Cause – *Why Things Went Awry*

- Acquisition agents relegated to a "trust and see" role
- Specs and standards loosely applied
- MA largely decoupled from design process
- Quality and review processes dramatically curtailed
- Test discipline greatly relaxed

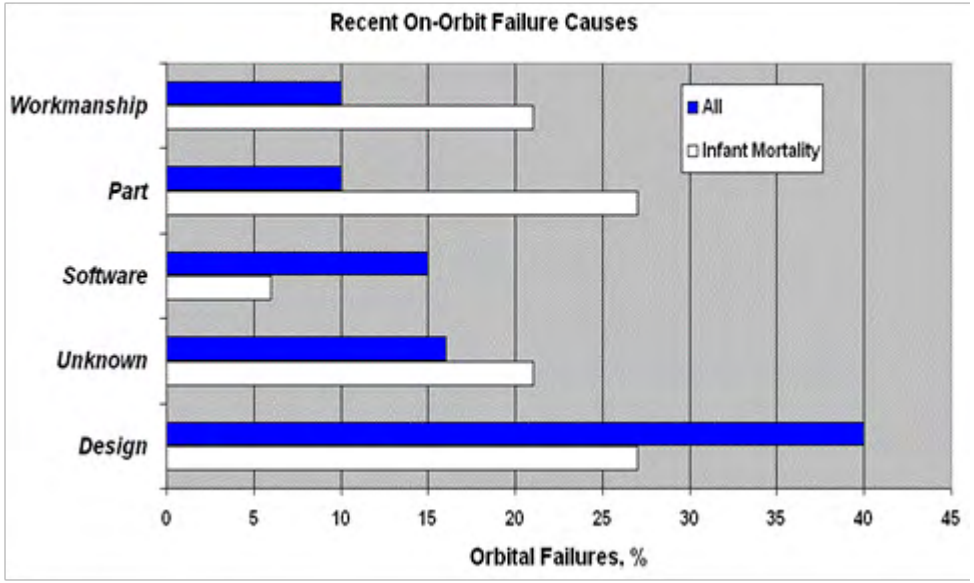
An Unforgiving Business; One Strike and You're Out

Post-97 Root Causes of Anomalies

-1997 Study-



-2008 Study-



- **Design issues are the dominant cause of on-orbit anomalies**
  - *Suggests flaws and potential improvements associated with design assurance activities*
- **Parts are not the dominant cause of total anomalies**
  - *Parts issues are most apparent during infant mortality—a proto-qual and testing issue*
- **Workmanship issues have decreased**
  - *More attention to testing and QA/MA practices*
- **The number of unknown anomalies has increased**
  - *Lack of solid understanding of —as-built" configuration*
- **Software is emerging as a leading source of anomalies**

Space System Development Cycle

Launch

Develop

- Requirements/ ConOps Definition
- System Concepts
- Technology Demonstration
- Design/Engineering

Acquire

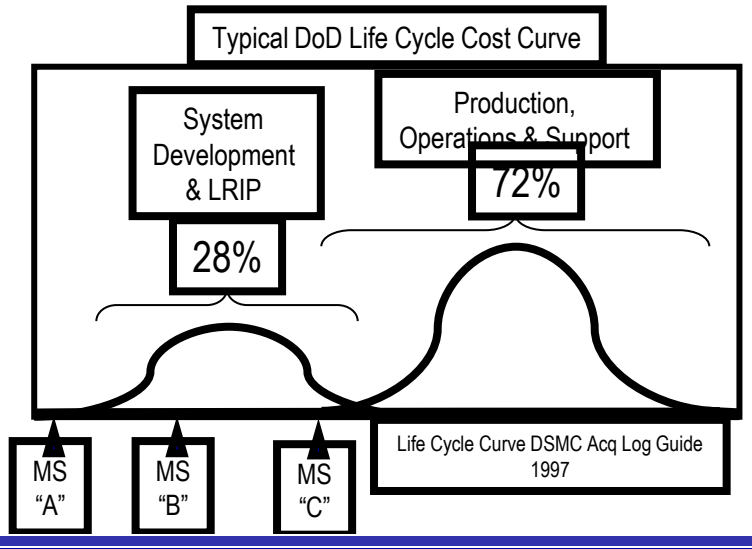
- Contract
- Manufacture/Produce/Code
- Assemble, Integration/Test
- Space-Ground-User Segment/Integration

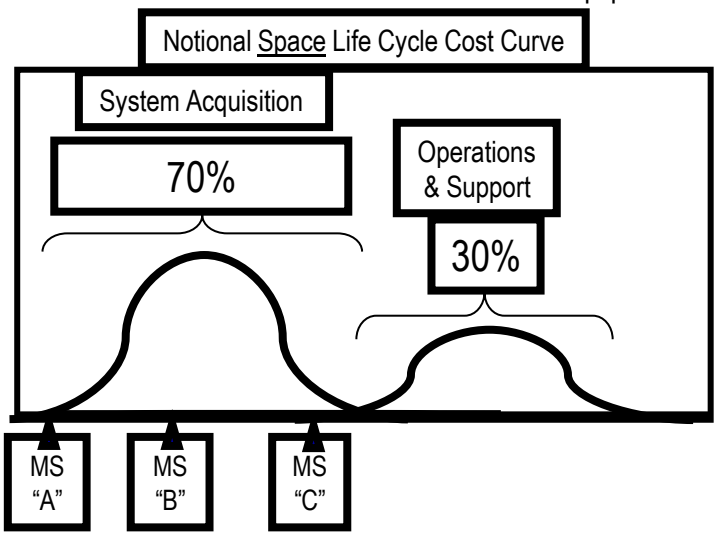
Sustain

- On-Orbit Constellation Mgmt
- Ground Systems
- Satellite Anomaly

Evolve

- Space/Ground Segments
- User Equipment

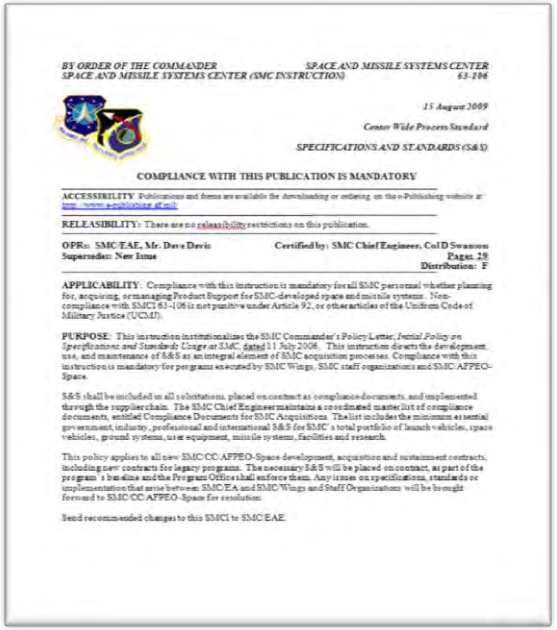




Majority of SMC Investment Dollars Spent in DT&E Phase

SMC Specs & Standards (S&S) Initiative

- Apply specs & standards as element of acquisition practices and toolset
- "Select" list of Space systems standards
- Issue Organizational Policy
- Specify critical standards in RFP
- Specs & Standards program is to ensure sound technical practices applied across NSS programs
- There is a cost to doing our business, but we were already doing to some extent, regardless of this initiative



BY ORDER OF THE COMMANDER
SPACE AND MISSILE SYSTEMS CENTER (SMC INSTRUCTION)

SPACE AND MISSILE SYSTEMS CENTER
63-106

15 August 2009

Center Wide Process Standard

SPECIFICATIONS AND STANDARDS (S&S)

COMPLIANCE WITH THIS PUBLICATION IS MANDATORY

ACCESSIBILITY: Publications and forms are available for downloading or ordering on the e-Publishing website at www.e-publishing.af.mil

RELEASIBILITY: There are no releasibility restrictions on this publication.

OPR: SMC/EAE, Mr. Dave Davis
Supersedes: New Issue

Certified by: SMC Chief Engineer, Col D Swanson
Pages: 28
Distribution: F

APPLICABILITY: Compliance with this instruction is mandatory for all SMC personnel whether planning for, acquiring, or managing Product Support for SMC-developed space and missile systems. Non-compliance with SMCI 63-106 is not punitive under Article 92, or other articles of the Uniform Code of Military Justice (UCMJ).

PURPOSE: This instruction institutionalizes the SMC Commander's Policy Letter, *Initial Policy on Specifications and Standards Usage at SMC*, dated 11 July 2008. This instruction directs the development, use, and maintenance of S&S as an integral element of SMC acquisition processes. Compliance with this instruction is mandatory for programs executed by SMC Wings, SMC staff organizations and SMC/AFPEO-Space.

S&S shall be included in all solicitations, placed on contract as compliance documents, and implemented through the supplier chain. The SMC Chief Engineer maintains a coordinated master list of compliance documents, entitled Compliance Documents for SMC Acquisitions. The list includes the minimum essential government, industry, professional and international S&S for SMC's total portfolio of launch vehicles, space vehicles, ground systems, user equipment, missile systems, facilities and research.

This policy applies to all new SMC/CC/AFPEO-Space development, acquisition and sustainment contracts, including new contracts for legacy programs. The necessary S&S will be placed on contract, as part of the program's baseline and the Program Office shall enforce them. Any issues on specifications, standards or implementation that arise between SMC/EA and SMC Wings and Staff Organizations will be brought forward to SMC/CC/AFPEO-Space for resolution.

Send recommended changes to this SMCI to SMC/EAE.

- SMC Instruction 63-106, issued 2009
- S&S integral to SMC acquisition process
- Applies to all new development, acquisition and sustainment contracts, including new large ECPs or contracts for legacy programs
- Contractual compliance through the supplier chain, as appropriate
- SMC/EN (Chief Engineer) is OPR

SMC Specifications and Standards Functional Areas

MANAGEMENT

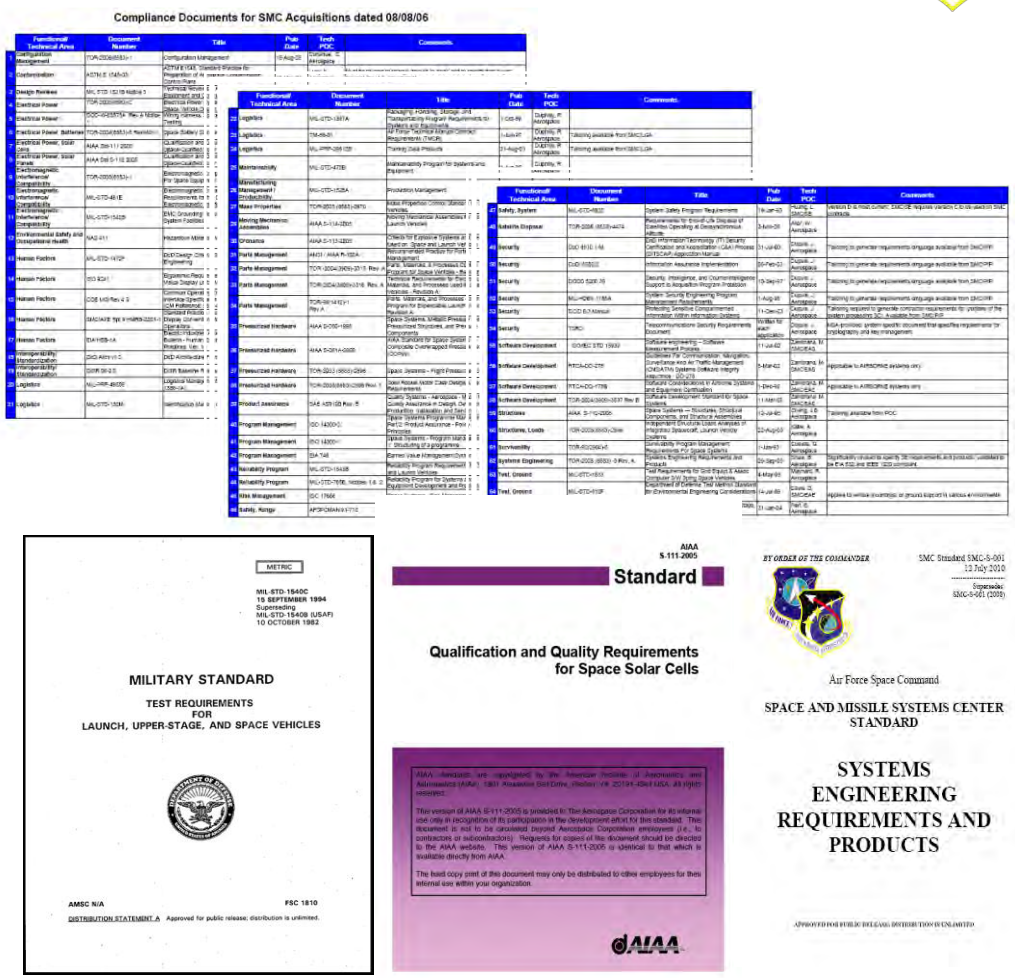
- Program Management
  - Systems Engineering
  - Product Assurance
  - Subcontract Management
  - Design Reviews
  - Configuration Management
  - Manufacturing and Production Management
  - Parts Management
  - Risk Management
  - System Safety
  - Occupational Safety and Health

TECHNICAL

- Electrical Power, (Batteries & Solar)
- Electromagnetic Interference & Control
- Environmental Engineering; Cleanliness
- Human Systems Integration
- Interoperability
- Logistics
- Maintainability
- Mass Properties
- Moving Mechanical Assemblies
- Ordnance
- Pressurized Systems & Components
- Parts, Materials & Processes
- Reliability/Availability
- Information Assurance/Program Protection
- Software Development
- Structures
- Survivability
- Test, Space & Ground

SMC Compliance Standards List

- **SMC Technical Baseline**
  - *68 documents*
  - *Includes all four space system segments*
  - *Approved by SMC/EA*
- **Comprises Formal, Stable, & Accessible Standards**
  - *Military (Mil-Std)*
  - *International (ISO)*
  - *Industry (AIAA)*
  - *SMC Standards*
- **Reflects current best practices**
- **Updated periodically**



Our Assessment: It's Working

Compliance Documents for SMC Acquisitions
(July 2010)

Line #	Functional; Technical Area	Document Number	Title	Pub Date	POC Org	Additional Usage Requirements
1	1.1 **Program Execution;** Program Management	SMC Standard SMC-S-019, Rev A	Program and Subcontractor Management	2008	SMC/EAS	none
2	1.1 **Program Execution;** Program Management	SMC Standard SMC-S-021, Vol 1	Vol 1: Technical Reviews & Audits for Systems, Equipment and Computer Software	2009	SMC/EAS	none
3	1.1 **Program Execution;** Program Management	SMC Standard SMC-S-002	Configuration Management	2008	SMC/EAS	none
4	1.1 **Program Execution;** Program Management	MIL-STD-1528A	Production Management	1986	SMC/EAS	none
5	1.1 **Program Execution;** Program Management	ISO 17666	Space Systems - Risk Management	2003	SMC/EAS	none
6	1.1 **Program Execution;** Program Management	ANSI/EIA 748-B	Earned Value Management Systems	2007	SMC/EAS	none

Characteristics of SMC Standards

- Requirements based- compliance in RFP and Contract
  - "Shall" based
  - Not tutorial / Guidance
  - "What" and not "How To"
    - Some exceptions
- Product requirements based on sound processes and key process attributes
  - Process attributes/criteria included in Standard
    - Alternative for "How To"
- Offeror may propose listed standard or another government
  - Industry technical society (IEEE, AIAA, etc.), international or corporate version
  - Provided it is comparable in rigor and effectiveness
  - will be placed on contract as a compliance document

Regardless of the documentation form, the compliance documents provide a clear technical baseline for government program to manage

Re-establishing Best Practices

Standards – Specifications

Design and Test "Best Practices"

• SV/LV Environmental Design & Test Requirements	SMC Standard
• Hardware Development Tests & Environments;	MIL-STD-810G
• Software Development & Verification; Mil-Std 498	SMC Standard
• Ground Equipment Test Requirements;	MIL-STD-1833
• Range Safety Requirements; EWR 127-1,	AFSPCMAN 91-710
• Mass Properties Controls for Space Systems	AIAA S-120-2006
• EMC Requirements; Mil-Std-1541A	SMC standard (AIAA)
• EMI/EMC Requirements; Mil-Std-461E	SMC Standard (AIAA)
• Wiring Harness Design & Testing	SMC Standard
• Battery Requirements	SMC Standard
• Solar Cell Development & Test; Aerospace TOR	AIAA S111-2005
• Solar Panels Development & Test; Aerospace TOR	AIAA S112-2005
• Moving Mech. Assemblies; Aerospace TOR	AIAA S114-2005
• Structural Design & Test Rqts; Aerospace TOR	AIAA S110-2005
• Metallic Pressure Vessels-Pressurized Structures;	AIAA S-080-1998
• Composite Overwrapped Pressure Vessels;	AIAA S-081-2000
• Solid Motor Case Design & Test Requirements;	SMC Standard
• Explosive Ordnance; (Aerospace TOR)	AIAA S113-2005
• Flight Pressurized Systems;	SMC Standard
• Technical Requirements for PMP; MIL-STD-1547B	SMC Standard
• Electrical Power Systems for Unmanned Spacecraft	AIAA S-122-2007
• Systems Engineering	SMC Standard

Background

Dr. Ashton B. Carter
Under Secretary of Defense for Acquisition, Technology & Logistics

Memo: September 14, 2010*

"Better Buying Power: Guidance for Obtaining Greater Efficiency and Productivity in Defense Spending"

Guidance Roadmap*

Memo: November 3, 2010*

"Implementation Directive for Better Buying Power - Obtaining Greater Efficiency and Productivity in Defense Spending"

* Ref: http://www.acq.osd.mil/

KEY THEMES

- **Target affordability and Cost Control**
  - Restore Affordability – Mandate as a requirement
  - Drive productivity growth through Will /Cost Should Cost management
  - Set shorter program timelines and manage them
- **Incentivize Productivity and Innovation in Industry**
  - Reward contractors for successful supply chain and indirect cost management
  - Increase the use of Fixed-Price Incentive Firm Target contracts
- **Reduce Non-productive processes and bureaucracy**
- **Improve tradecraft in service acquisition**
  - Prevent requirements creep

Industry Partnership

- Highly desirable
  - ……perhaps politically mandatory!!
  - Collaboration based product/process technical practices
  - Facilitates detailed technical discussions about success, philosophy, etc of our technical practices
- Benefits
  - Common understanding/expectations
  - Common technical language
  - Common RFP/Contract Tools
- Increased visibility and understanding of industry practices
  - Including span of industry customer base
- However, selection of Industry partners critical
    - Willingness to publish standard consistent with government needs
    - Could/would be basis for military standard if no cooperative agreement with an industry organization established

Summary

- Use of standards as “normal” part of Govt toolbox recommended
  - States expectations/requirements of govt customer
    - Let’s industry know what’s important to customer
    - Helps level playing field
  - There is a cost to doing our business, but we should already be doing, regardless of this initiative
- IMHO - Teaming with industry essential!!
  - For both technical and political reasons
  - Selection of Industry partners critical
    - Willingness to publish standard consistent with government needs
    - Basis for military standard if no cooperative agreement with an industry organization established

Summary

- S&S Synchronization a high priority within National Security Space
  - Achieve MA Objectives
    - Ensure sound technical practices applied across NSS programs
    - Ensure adequate resources baselined
  - Commonality/consistency of practices "across our community"
    - Govt NSS; Primes; subs; sub-tier supply base
    - “Right Size” our Standards
    - Consistent with contractor practices
- Institutionalization practices
  - Disciplined implementation
    - Consistent implementation on both sides

Continue dialogue to achieve above objectives

Healthy tension must be embraced and not discarded

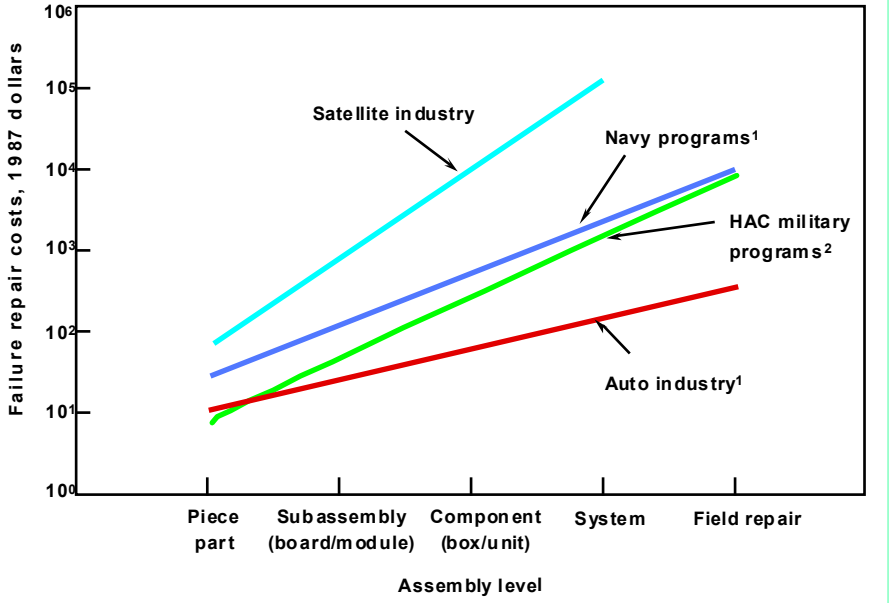
Back-up

PMP Issue
Impact of PMP Failures

- **Cost impacts magnified if not discovered until late in build cycle**

- **Costly PMP Problems**
  - Heterojunction Bipolar Transistor (HBT)
- **Inadequately Qualified**
  - Field Programmable Gate Array (FPGA)
    - **Inadequate Test**
  - Ceramic capacitors
    - **Defective**
  - Stacked ceramic capacitors
    - **Inadequate Process Control**
  - Tin Whiskers
    - **Poor Prohibited Materials Control**

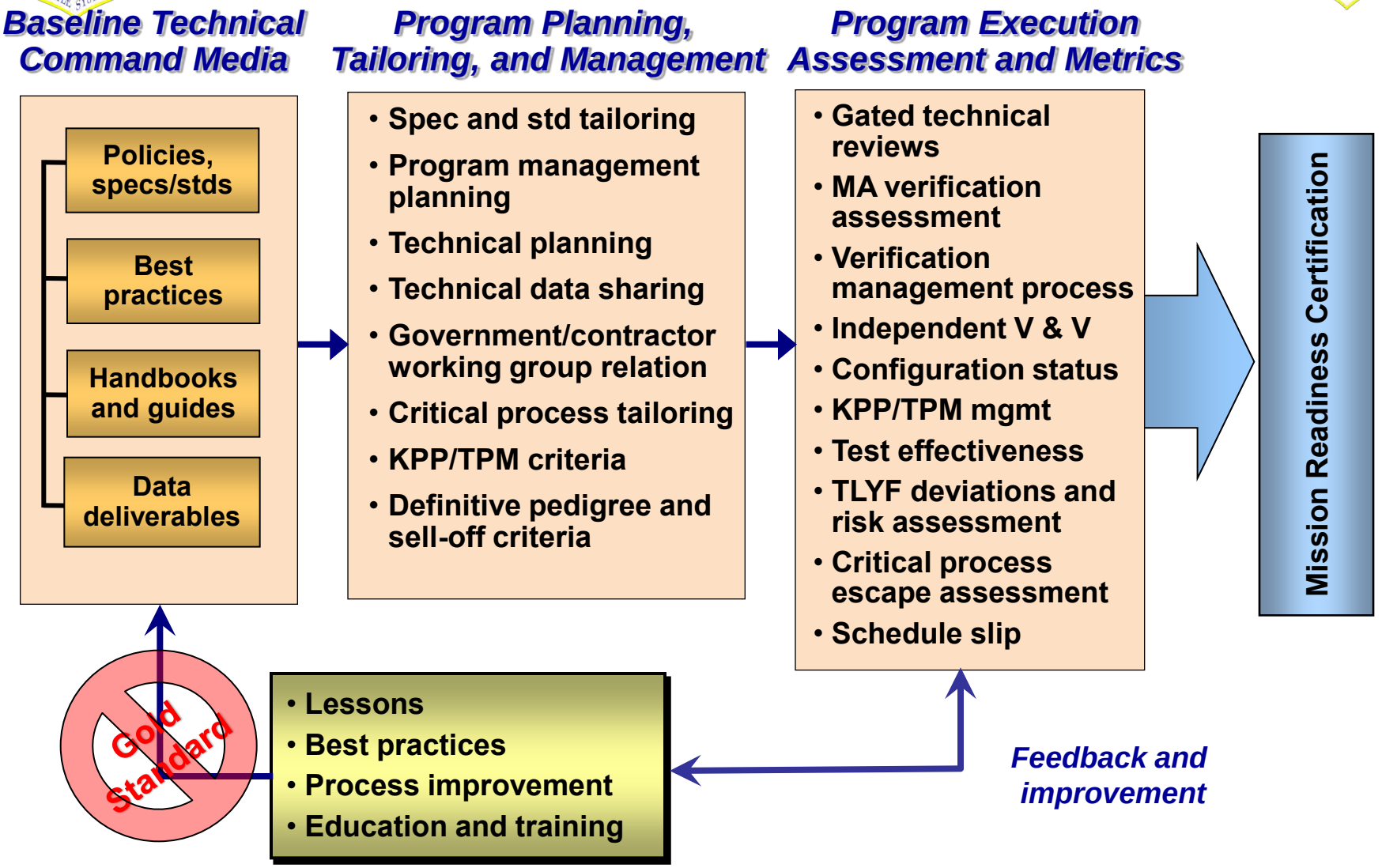
Large Cost Savings When Failures Caught Early[3]



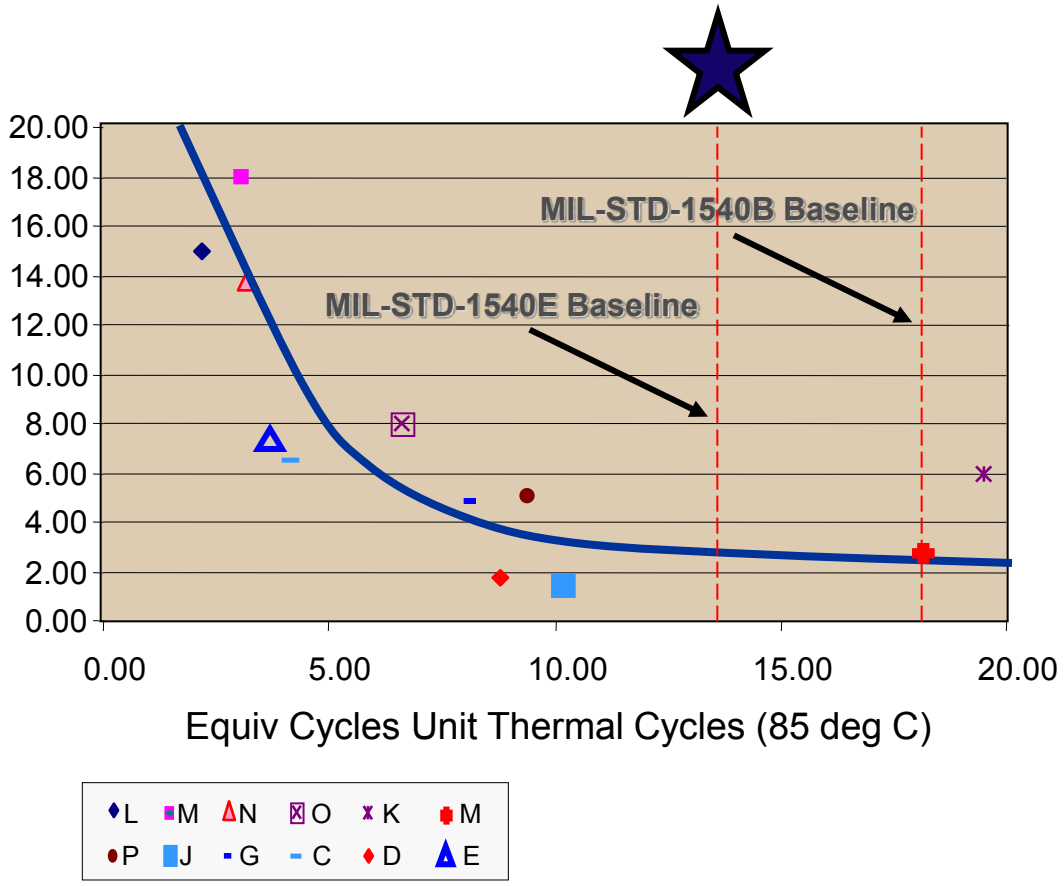
1. W.J. Willoughby, IES National Conference, 1978
2. A. Saari, RADC Report TR-82-87, 1982
3. Chart provided by Bruce Arnheim, Aerospace Corp.

Increased PMP Failure Risk → Importance of PMP Programs

SMC Systems Engineering Process Overview



Example: Unit Thermal Test Erosion



- **Data shows reducing thermal cycles has an effect on problems during system thermal testing**
- **Note: with increasing complexity comes increasing harness and thermal equipment problems.** ***Unit level testing will not solve this system TV problem***

Equiv Cycles = Test cycles*(Delta ^{o}C/85)^{2}

Reducing unit thermal cycles results in increased system test defects

Contract Implementation

3. Initial Applicable Documents
(Compliance & Reference)
for
A Typical Satellite Vehicle Acquisition Program
For Prescribed Development

ANNEX A TO ATTACHMENT 1
RFP NO. 000000-00-0-0000
Prepared by SMC/AXEM
00 Month 0000
Revised 00 Month 0000

The Offeror may propose the listed specification or standard contained herein or another government, industry technical society (IEEE, AIAA, etc.), international or corporate version, provided it is comparable in rigor and effectiveness. If alternative standards are proposed, the Offeror must provide information that shows that the recommended alternative provides the same level of efficacy as does the listed specification/standard. In all cases the acceptable responses will be placed on contract as a compliance document.

SMC/EA team engages directly with SPO and ACE during RFP development to identify applicable standards.

DoD " Better Buyer" and Efficiency Initiatives and Potential Impacts

Compliance Documents for SMC Acquisitions
19 July 2010

This list establishes the specifications and standards
to be used on all new SMC contracts
in accordance with
SMC Instruction 63-106
dated 1 October 2009

David E. Swanson
Colonel, USAF
SMC/EA

2 Aug 2010
Date

Contentious Technical Issues

- **Heritage/Legacy Hardware**
  - *Design Practices*
  - *Qualification Practices*
  - *—We've flown this box on xx missions successfully"*
    - *Traceability back to design and test practices critical – on both government and industry sides*
- **PM&P**
  - *Derating*
  - *Part Quality*
    - *Screens*
    - *QCI (Quality Conformance testing)*
- **EMI/EMC**
  - *Design Margins*
  - *Testing*
- **Space Systems Environmental Test**
  - *Qual/Proto-qual*
  - *Design levels*

Line #	Functional; Technical Area	Document Number	Title	Pub Date	POC Org	Additional Usage Requirements
7	1.2 **Program Execution;** Systems Engineering	SMC Standard SMC-S-001	Systems Engineering	2010	SMC/EAS	none
8	1.3 **Program Execution;** Product Assurance	SMC Standard SMC-S-003	Quality Systems	2008	SMC/EAS	Use on all high-reliability space and launch vehicles
9	1.3 **Program Execution;** Product Assurance	SAE AS9100 Rev. B	Quality Systems - Aerospace - Model for Quality Assurance in Design, Development, Production, Installation and Servicing	2006	SMC/EAS	Use on all ground and user-equipment
10	1.4 **Program Execution;** Program Protection	DoDI 8500.2	Information Assurance Implementation	2003	SMC/PIP	- Coordinate tailoring to generate requirements language with SMC/PIP - Contract-specific specification shall be configuration controlled by SMC/PIP and levied on contract
11	1.4 **Program Execution;** Program Protection	DCID 6/3 Manual	Protecting Sensitive Compartmented Information Within Information Systems	2003	SMC/PIP	- Tailored to generate contractor requirements for portions of the system processing SCI - Coordinate with POC and SMC/PIP
		Intelligence Community Directive Number 503	Intelligence Community Information Technology System Security Risk Management, Certification, & Accredidation	2005		

Line #	Functional; Technical Area	Document Number	Title	Pub Date	POC Org	Additional Usage Requirements
12	1.4 **Program Execution;** Program Protection	DOD 5220-22M	National Industrial Security Program	2006	SMC/PIP	- Coordinate tailoring/CDRLs with SMC/PIP. - Shall be levied on contract as part of DD 254
13	1.4 **Program Execution;** Program Protection	DODI 8510.01	DoD Information Assurance Certification and Accreditation Process (DIACAP)	2007	SMC/PIP	- Tailoring required to generate requirements language - Coordinate with POC and SMC/PIP
14	1.4 **Program Execution;** Program Protection	DoDM 5200.39-M	Procedures for Critical Program Information (CPI) Protection Within the Department of Defense	2008	SMC/PIP	- Coordinate tailoring/CDRLs with SMC/PIP. - Levy on contract as part of DD 254
15	1.4 **Program Execution;** Program Protection	AFPAM 63-1701	Program Protection Planning	2003	SMC/PIP	- Coordinate tailoring/CDRLs with SMC/PIP. - Levy on contract as part of DD 254
16	1.4 **Program Execution;** Program Protection	AFPD 63-17	Technology and Acquisition Systems Safety Program Protection	2001	SMC/PIP	- Coordinate tailoring/CDRLs with SMC/PIP. - Levy on contract as part of DD 254
17	2.1 **Vehicle/Ground Design** Structures	AIAA S-110-2005	Space Systems — Structures, Structural Components, and Structural Assemblies	2005	SMC/EAS	none

Line #	Functional; Technical Area	Document Number	Title	Pub Date	POC Org	Additional Usage Requirements
18	2.1 **Vehicle/Ground Design** Structures	SMC Standard SMC-S-004	Independent Structural Loads Analysis	2008	SMC/EAS	none
19	2.2 **Vehicle/Ground Design** Moving Mechanical Assemblies	AIAA S-114-2005	Moving Mechanical Assemblies for Space and Launch Vehicles	2005	SMC/EAS	none
20	2.3 **Vehicle/Ground Design** Pressurized Hardware	AIAA S-080-1998	Space Systems, Metallic Pressure Vessels, Pressurized Structures, and Pressure Components	1998	SMC/EAS	Coordinate tailoring with POC and SMC/SES
21	2.3 **Vehicle/Ground Design** Pressurized Hardware	AIAA S-081A-2006	Space Systems — Composite Overwrapped Pressure Vessels (COPVs)	2006	SMC/EAS	Coordinate tailoring with POC and SMC/SES
22	2.3 **Vehicle/Ground Design** Pressurized Hardware	SMC Standard SMC-S-005	Space Systems – Flight Pressurized Systems	2009	SMC/EAS	Coordinate tailoring with POC and SMC/SES
23	2.3 **Vehicle/Ground Design** Pressurized Hardware	SMC Standard SMC-S-006	Solid Rocket Motor Case Design & Test Requirements	2008	SMC/EAS	Coordinate tailoring with POC and SMC/SES
24	2.4 **Vehicle/Ground Design** Electrical Power	AIAA S-122-2007	Electrical Power Systems for Unmanned Spacecraft	2007	SMC/EAS	none

Line #	Functional; Technical Area	Document Number	Title	Pub Date	POC Org	Additional Usage Requirements
25	2.4 **Vehicle/Ground Design** Electrical Power	SMC-S-020	Technical Requirements for Wiring Harness, Space Vehicle	2009	SMC/EAS	none
26	2.4 **Vehicle/Ground Design** Electrical Power	SMC Standard SMC-S-007	Space Battery	2008	SMC/EAS	none
27	2.4 **Vehicle/Ground Design** Electrical Power	SMC Standard SMC-S-017	Lithium Ion Battery for Spacecraft Applications	2008	SMC/EAS	none
28	2.4 **Vehicle/Ground Design** Electrical Power	SMC Standard SMC-S-018	Lithium Ion Battery for Launch Vehicle Applications	2008	SMC/EAS	none
29	2.4 **Vehicle/Ground Design** Electrical Power	AIAA S-111-2005	Qualification and Quality Requirements for Space-Qualified Solar Cells	2005	SMC/EAS	none
30	2.4 **Vehicle/Ground Design** Electrical Power	AIAA S-112-2005	Qualification and Quality Requirements for Space-Qualified Solar Panels	2005	SMC/EAS	none
31	2.4 **Vehicle/Ground Design** Electrical Power	SMC Standard SMC-S-008	Electromagnetic Compatibility Requirements For Space Equipment and Systems	2008	SMC/EAS	none
32	2.4 **Vehicle/Ground Design** Electrical Power	MIL-STD-461F	Electromagnetic Emissions and Susceptibility, Requirements for the Control of Electromagnetic Interference	2008	SMC/EAS	none
33	2.4 **Vehicle/Ground Design** Electrical Power	MIL-STD-1542B	EMC Grounding Requirements for Space System Facilities	1991	SMC/EAS	none

Line #	Functional; Technical Area	Document Number	Title	Pub Date	POC Org	Additional Usage Requirements
34	2.5 **Vehicle/Ground Design** Ordnance	AIAA S-113-2005	Criteria for Explosive Systems and Devices Used on Space and Launch Vehicles	2005	SMC/EAS	Coordinate tailoring with POC and SMC/SEO
35	2.6 **Vehicle/Ground Design** Parts, Materials, & Processes	ASTM E 1548-2009	Standard Practice for Preparation of Aerospace Contamination Control Plans	2009	SMC/EAS	Tailor as follows: - change 'should' to 'shall' - specify that 'buyer' includes the U.S. government.
36	2.6 **Vehicle/Ground Design** Parts, Materials, & Processes	ANSI/AIAA R-100A-2001	Recommended Practice for Parts Management	2001	SMC/EAS	Use on ground and user-equipment
37	2.6 **Vehicle/Ground Design** Parts, Materials, & Processes	SMC Standard SMC-S-009	Parts, Materials, & Processes Control Program for Space and Launch Vehicles	2009	SMC/EAS	none
38	2.6 **Vehicle/Ground Design** Parts, Materials, & Processes	SMC Standard SMC-S-010	Technical Requirements for Electronic Parts, Materials, and Processes For Space and Launch Vehicles	2009	SMC/EAS	none
39	2.6 **Vehicle/Ground Design** Parts, Materials, & Processes	SMC Standard SMC-S-011	Parts, Materials, and Processes Control Program for Expendable Launch Vehicles	2008	SMC/EAS	none
40	3.1 **Information Technology;** Software	ISO/IEC 15939	Software engineering - Software Measurement Process	2007	SMC/EASS	none
41	3.1 **Information Technology;** Software	SMC Standard SMC-S-012	Software Development for Space Systems	2008	SMC/EASS	none

Line #	Functional; Technical Area	Document Number	Title	Pub Date	POC Org	Additional Usage Requirements
42	3.2 **Information Technology;** Interoperability	DoD Arch V2.0	DOD Architecture Framework Volumes I, II, and III	2009	SMC/EAA	none
43	3.2 **Information Technology;** Interoperability	DISR 10-1.0	DOD Information Technology Standards Registry (DISR)	2010	SMC/EAA	NOTE: Updates 3-times per year; Verify current version at DISR ONLINE website prior to specification on RFPs
44	4.1 **Engineering Specialties;** Reliability	SMC Standard SMC-S-013	Reliability Program for Space Systems	2008	SMC/EAS	Use on launch and space (payload & bus) vehicles
45	4.1 **Engineering Specialties;** Reliability	MIL-STD-785B including Notices 1 & 2	Reliability Program for Systems and Equipment Development and Production	1988	SMC/EAS	Use on ground and user-equipment
46	4.2 **Engineering Specialties;** Survivability	SMC Standard SMC-S-014	Survivability Program For Space Systems	2010	SMC/EAS	none
47	4.3 **Engineering Specialties;** Maintainability	MIL-STD-470B	Maintainability Program for Systems and Equipment	1995	SMC/EAS	none
48	4.4 **Engineering Specialties;** Human Systems Integration	MIL-STD-1472F including Notice 1	DoD Design Criteria Standard - Human Engineering	1999	SMC/EAS	none

Line #	Functional; Technical Area	Document Number	Title	Pub Date	POC Org	Additional Usage Requirements
49	4.4 **Engineering Specialties;** Human Systems Integration	SMC-S-023, Vols 1 & 2	Human Computer Interface Desgn Criteria Vol 1: User Interface Requirements Vol 2: Space System Operations Displays	2010	SMC/EAS	none
50	4.4 **Engineering Specialties;** Human Systems Integration	EIA HEB-1A	Electronic Industries Alliance Engineering Bulletin - Human Engineering - Principles and Practices	2005	SMC/EAS	none
51	4.5 **Engineering Specialties;** Integrated Logistics Support	MIL-PRF-49506	Logistics Management Information	1996	SMC/PIL	Coordinate tailoring with SMC/PIL
52	4.5 **Engineering Specialties;** Integrated Logistics Support	MIL-STD-1545	Optional Spare Parts, Maintenance and Inventory Support of Space and Missile System.	1977 1992 (Validation)	SMC/PIL	Use on development contracts
		MIL-STD-1538	Spare Parts and Maintenance Support of Space and Missile Systems Undergoing RDT&E	1973 1992 (Validation)		Use on RDT&E efforts
53	4.5 **Engineering Specialties;** Integrated Logistics Support	MIL-STD-130N	Identification Marking of U.S. Military Property	2008	SMC/PIL	Coordinate tailoring with SMC/PIL
54	4.5 **Engineering Specialties;** Integrated Logistics Support	MIL-STD-1367A	Packaging, Handling, Storage, and Transportability Program Requirements for Systems and Equipments	1989	SMC/PIL	- Use on Space Segment - Coordinate tailoring with SMC/PIL

Line #	Functional; Technical Area	Document Number	Title	Pub Date	POC Org	Additional Usage Requirements
55	4.5 **Engineering Specialties;** Integrated Logistics Support	MIL-STD-1366E	Transportability Criteria	2003	SMC/PIL	- Use on Ground and User Equipment - Coordinate tailoring with SMC/PIL
56	4.5 **Engineering Specialties;** Integrated Logistics Support	MIL-STD-2073-1E	Standard Practice for Military Packaging	2008	SMC/PIL	Coordinate tailoring with SMC/PIL
57	4.5 **Engineering Specialties;** Integrated Logistics Support	TMCR-86-01/N	Air Force Technical Manual Contract Requirements (TMCR)	2010	SMC/PIL	Coordinate tailoring with POC and SMC/PIL
58	4.5 **Engineering Specialties;** Integrated Logistics Support	MIL-PRF-29612B	Training Data Products	2001	SMC/PIL	Coordinate tailoring with POC and SMC/PIL
59	4.6 **Engineering Specialties;** Mass Properties	AIAA S-120-2006	Mass Properties Control for Space Systems	2006	SMC/EAS	Required SMC tailoring in SMC-T-002 (2008)
60	4.7 **Engineering Specialties;** System Safety	EWR 127-1	Eastern and Western Range Range Safety Requirements	1997.0	SMC/SES	Use on legacy systems initially aquired before 2004
		AFSPCMAN 91-710	Range Safety User Requirements Manual	2004.0		Use on launch systems aquired after 2004
61	4.7 **Engineering Specialties;** System Safety	MIL-STD-882C	System Safety Program Requirements	1993	SMC/SES	The current version D is acquisition reform version; SMC/SE requires Version C *without* Notice 1.

Line #	Functional; Technical Area	Document Number	Title	Pub Date	POC Org	Additional Usage Requirements
62	4.8 **Engineering Specialties;** Environmental	SMC Standard SMC-S-015	End-of-Life Disposal of Satellites in Geosynchronous Altitude	2010	SMC/EAS	none
63	4.8 **Engineering Specialties;** Environmental	SMC Standard SMC-S-022	Requirements for End-of-Life Disposal of Satellites in Low Earth Orbits	2010	SMC/EAS	none
64	4.8 **Engineering Specialties;** Environmental	NASA STD 8719.14, Rev. 4	Process For Limiting Orbital Debris	2009	SMC/EAS	Required SMC tailoring in SMC-T-003 (2010)
65	4.8 **Engineering Specialties;** Environmental	NAS 411	Hazardous Materials Management Program	1995	SMC/EAS SMC/SEB	none
66	5.1 **Test;** Launch/Space Vehicle	SMC Standard SMC-S-016	Test Requirements For Launch, Upper-Stage, & Space Vehicles	2008	SMC/EAS	none
67	5.2 **Test;** Ground System	MIL-STD-1833	Test Requirements for Gnd Equipt & Assoc Computer S/W Sptng Space Vehicles	1989	SMC/EAS	none
68	5.2 **Test;** Ground System	MIL-STD-810G	Department of Defense Test Method Standard for Environmental Engineering Considerations and Laboratory Tests	2008	SMC/EAS	none